

Relicensing Study 3.8.1

EVALUATE THE IMPACT OF CURRENT AND POTENTIAL FUTURE MODES OF OPERATION ON FLOW, WATER ELEVATION AND HYDROPOWER GENERATION

Initial Study Report Summary

**Northfield Mountain Pumped Storage Project (No. 2485)
and Turners Falls Hydroelectric Project (No. 1889)**

Prepared for:



Prepared by:



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1.1 Study Summary

Study No. 3.8.1 *Evaluate the Impacts of Current and Potential Future Modes of Operation on Flow, Water Elevation and Hydropower Generation* includes the development of an operations model of the Connecticut River from TransCanada's Wilder Dam to the Holyoke Gas and Electric's Holyoke Dam. The purpose for developing the operations model is to evaluate the impacts of alternative modes of operation on water elevations, flows and hydropower generation.

There has been no consultation with stakeholders required for this study since issuance of the Federal Energy Regulatory Commission's (FERC) Study Plan Determination Letter (SPDL).

1.2 Study Progress Summary

Task 1. Modify Model

FirstLight has modified the HEC-ResSim simulation model provided by the United States Corps of Engineers (USACOE) via The Nature Conservancy (TNC) to reflect the following:

- Converted the daily time step model to an hourly time step model. Currently the model's period of record extends from 1960-2003; however, the United States Geological Survey (USGS) via TNC has updated the hydrologic data to include the period 2004 to 2012. FirstLight has incorporated the inflows from tributaries between TransCanada's Wilder Dam down to Holyoke Dam. However, the inflow to Wilder Dam must be provided to FirstLight from the USACOE as it needs to run its HEC-ResSim model of the entire system and provide FirstLight with the regulated Wilder inflow data (FirstLight's model does not extend upstream beyond Wilder Dam).
- The model provided to FirstLight by the USACOE was also modified to better simulate
 - the Northfield Mountain Project pumping and generating cycles;
 - water level fluctuations observed in the Turners Falls Impoundment and Upper Reservoir; and
 - the timing and magnitude of fish ladder flows, attraction flows and bypass flows

Task 2. Calibration

The modified HEC-ResSim model was calibrated to annual generation at the FirstLight projects and three TransCanada projects (Wilder, Bellows Falls and Vernon) for the year 2000. This was a year in which no changes to the turbine electrical or hydraulic capacities occurred at the FirstLight and TransCanada Projects. Note that once the 2004-2012 hydrologic data is added to the HEC-ResSim model, the model may be verified with the most up-to-date station electrical and hydraulic capacities. Overall the annual energy calibration was within 10% of observed annual generation at the facilities.

The model was also calibrated to mean daily flows at two USGS gages on the Connecticut River including the North Walpole, NH gage (Gage No. 01154500) located above Bellows Falls Dam and the Montague, MA gage (Gage No. 01170500) located below Cabot Station and the Deerfield River.

Task 3. Establish Baseline Model

The calibrated model was subsequently updated to reflect today's equipment and operating conditions- this model is referred to as the baseline model. The baseline model serves as the point of comparison to

alternative operating scenarios (termed “production runs”). All production runs will subsequently be compared to the baseline model results relative to water elevations, flows and generation.

Task 4. Production Runs

FirstLight has used the model internally to evaluate the impact on generation, impoundment elevations and flows from various modes of operation. For example, the model was used to simulate conditions under the Temporary Amendment FirstLight is seeking relative to using more of the Northfield Mountain Project Upper Reservoir. FirstLight will use the model in the future to simulate alternative operating conditions.

Task 5. Use of Model Output for other Uses

The HEC-ResSim model will be used to inform other studies such as the instream flow study. The instream flow study will develop habitat versus flow relationships for various species and life stages of fish. The habitat versus flow relationship can be married with the operations modeling hourly discharge data – such as below Cabot Station—to develop habitat versus time graphs.

Task 6. Report

A final report will be completed in the 1st quarter of 2017, after all field studies are completed so that various alternative operating scenarios can be evaluated.

1.3 Variances from Study Plan and Schedule

To date, there have been no variances from the study plan.

1.4 Remaining Activities

- Update hydrologic period of record to include 2004-2012.
- Obtain from the USACOE the inflow to Wilder from their operations model for the period 2004-2012.
- Validate the model calibration based on the 2004-2012 hydrology.
- Simulate various production runs.
- Complete a final report.